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(54) Actuator for a lever for locking an automobile lock

(57) The actuator has a carriage (8) which is connected to the lever to be shifted. Supply of current to the motor (11) rotates a ramp carrying element (7) and this shifts the carriage (8) by action of helical ramps (18) on pins (29) carried by the carriage. A device comprising a cam (20) and switch (10) interrupts the supply of current to the motor at the end of a quarter of a rotation of the element (7) and the pins (29) are then disposed between two successive ramps (18). The carriage can be shifted without obstacle with small effort by a manual action on the lever. The actuator may be used for the simultaneous locking or unlocking of all the locks of an automobile.

FIG.1

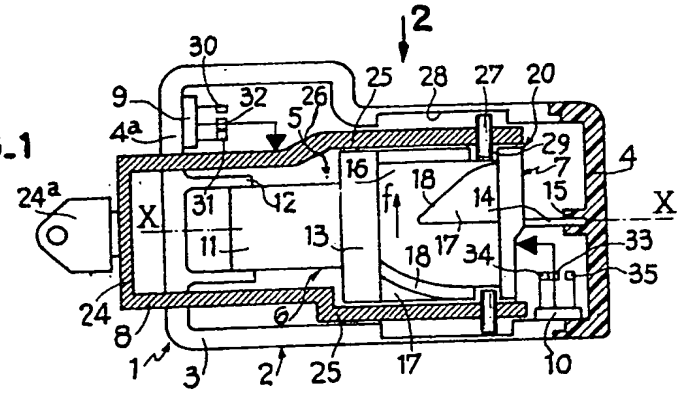

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FIG_1

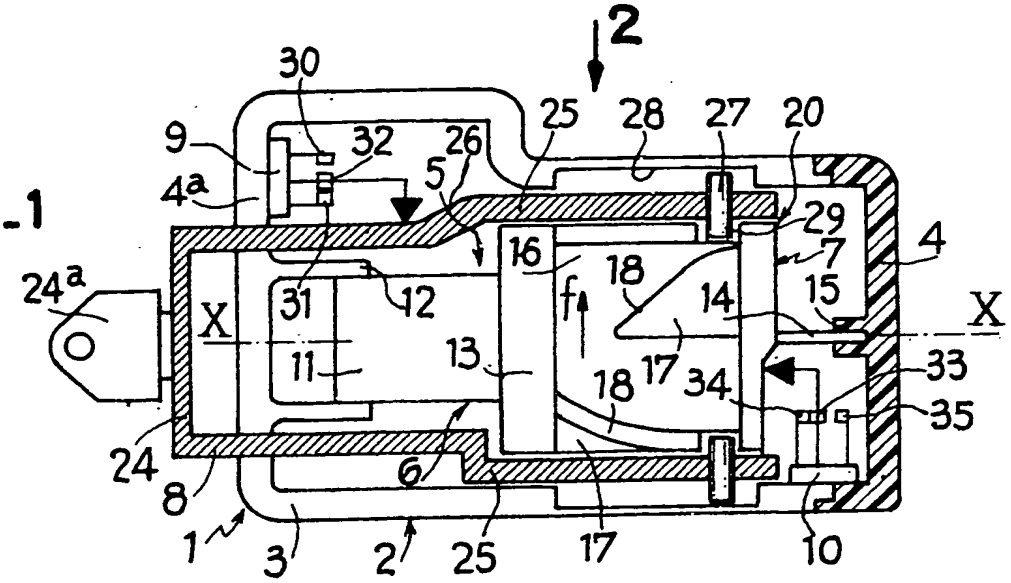


FIG_2

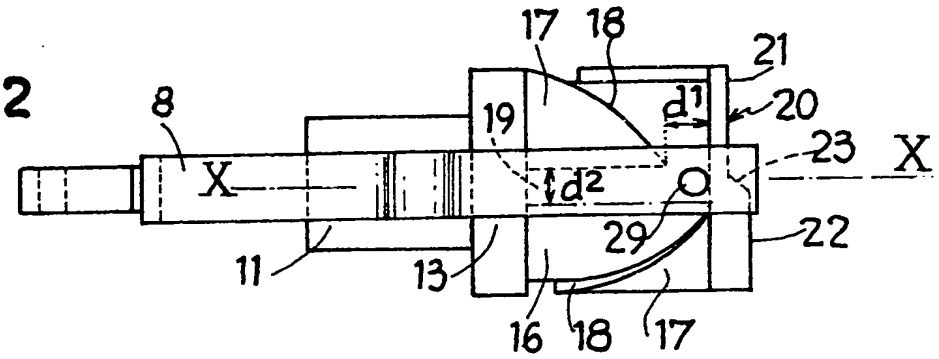


FIG_3

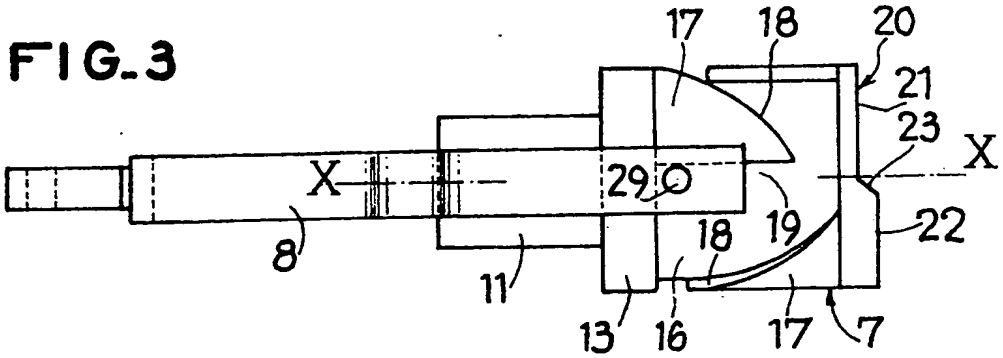


FIG_4

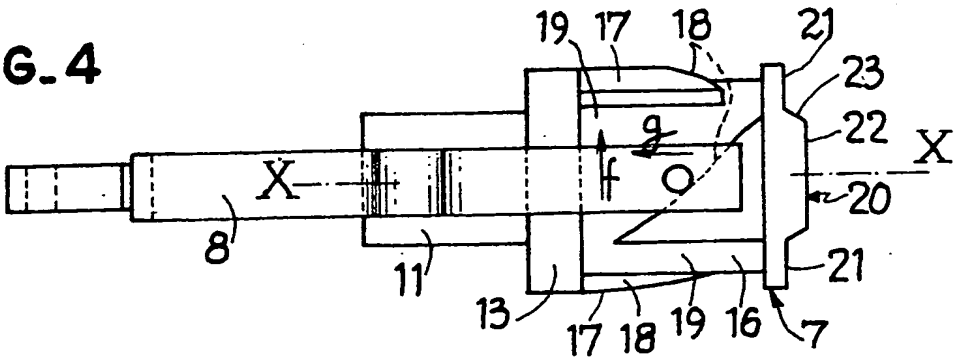
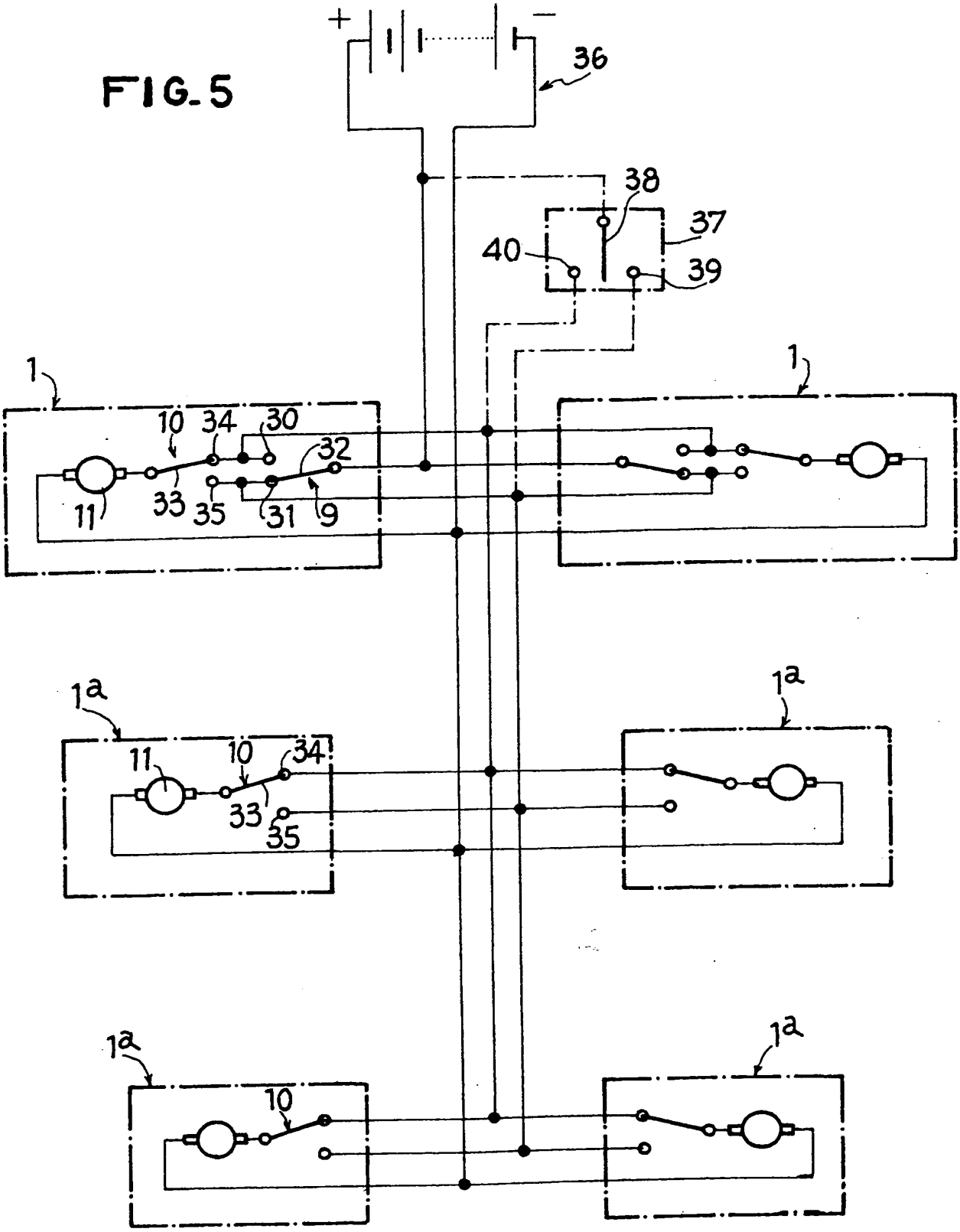


FIG. 5



SPECIFICATION

Actuator for a lever having two stable positions and in particular a lever for locking an automobile lock

The present invention relates to an actuator for shifting a lever having two stable positions and in particular a lever for locking or rendering an automobile lock inoperative.

An object of the invention is to provide an actuator for manually shifting the lever with a relatively small force in the case of failure of the supply of electric current, for example when the battery of the vehicle is out of action or a wire has been accidentally cut.

For this purpose, the actuator according to the invention comprises: a carriage movable between two extreme positions and adapted to be connected to the lever in such manner that these two positions correspond to the stable positions of the lever; a movable ramp carrying element which comprises two ramps acting in opposite directions on a projection of the carriage so as to cause the carriage to move from one extreme position to the other; an electric motor for driving the ramp carrying element; and means for interrupting the supply of current to the motor when the ramp carrying element reaches a position in which neither of the two ramps is in the path of the projection of the carriage.

Another object of the invention is to provide a device for simultaneously actuating a plurality of levers at least one of which levers may be actuated manually. This device comprises an actuator such as defined hereinbefore connected to each lever; the actuator connected to the lever which is manually controlled comprises a control switch having two positions controlling the supply of current to the motor in combination with said interrupting means and actuated by the displacement of the carriage; and the connections are such that the supply of current to the motor of this actuator results in the simultaneous supply of current to the motors of the other actuators.

Further features and advantages of the invention will be apparent from the ensuing description which is given merely by way of example with reference to the accompanying drawings in which:

Fig. 1 is a view partly in section of an actuator according to the invention;

Fig. 2 is a partial view in the direction of arrow 2 of Fig. 1;

Fig. 3 is a view similar to Fig. 2 but in which the carriage has been shifted manually;

Fig. 4 is a view similar to Fig. 2 but in which the carriage is in the course of a motorized displacement;

Fig. 5 is an electric diagram of an autobile equipped with six actuators according to the invention.

The actuator 1 shown in Fig. 1 is adapted to equip an automobile lock for the purpose of locking it or unlocking it or rendering it inoperative or operative. These various components are mounted in a case 2 formed by a body 3 in two halves of generally cylindrical shape and having an axis X—X provided with a cover 4 which forms the base thereof. The actuator is essentially formed by a driving unit 5 having an axis X—X and including a motor-speed reducing unit 6 and a ramp carrying element 7, a carriage 8 and two electric switches 9 and 10.

The motor-speed reducer unit 6 comprises an electric motor 11 whose housing is fixed by one end in an annular collar 12 which axially projects from the end 4a of the body 3 opposed to the cover 4. The output shaft of this motor drives a planetary speed reducing train 13 on the output element of which is fixed the ramp carrying element 7. The latter also has a generally cylindrical shape and is maintained centered on the axis X—X by means of an axial rod 14 which extends it and is journalled at its free end in a second annular collar 15 which axially projects from the inner face of the cover 4.

The motor 11 is a DC motor having a single direction f of rotation and supplied with current by the battery of the vehicle and provided with an electronic brake (not shown) which controls the inertia thereof.

The element 7 has a cylindrical hub 16 which carries four projections 17 which have a constant thickness and are equally spaced apart on its periphery. Each projection 17 has in plan the general shape of a right-angle triangle having a curvilinear hypotenuse. This triangle has one side of the right angle coincident with the periphery of a base of the hub 16 on a little less than 90° of this periphery and the other side of this right angle parallel to the axis X—X and stopping short of the other base of the hub by a small distance d^1.

Its hypotenuse 18 faces in the direction f and defines a ramp of a helical can.

The projections 17 are alternately adjacent to the two bases of the hub 16 and a group of two projections is found again in an identical manner by rotation through 180° about the hub 16. In the circumferential direction, each projection is spaced from the following by a gap 19 whose width d^2 is of the same order as the distance d^1 (Fig. 2).

The hub 16 is also provided on the periphery of the base thereof opposed to the motor unit 6 with a circular cam 20 comprising two regions of small thickness 21 which are diametrally opposed and two regions 22 of greater thickness which are diametrally opposed and placed between the two preceding regions. Each region, which extends through 90°, is connected to the two adjacent regions by a slope 23. The slopes 23 are located in alignment with the gaps of width d^2 between the successive projections 17. The outside diameter of the cam 20 exceeds that of the hub 16 and is equal to that of the projections 17.

The carriage 8 is formed by a U-shaped yoke whose web 24 is outside the body 3 and parallel to the end wall 4a of the latter. The two branches 25 of the U slidably extend through two openings provided in the end wall 4a in a direction parallel

to the axis X—X. Mid-way of their length these branches have a step which increases the distance therebetween since they extend on each side of the speed reducer 13 and the ramp carrying element 7. The step of one of the branches 25 constitutes an inclined cam 26.

The free end of each branch 25 carries two opposed pins: an outer pin 27 which is slidably received in a longitudinal guide groove 28 provided in the inner wall of the body 3, and an inner pin 29 which extends almost to the hub 16 of the element 7. The diameter of the pin 29 is a little less than the distances d^1 and d^2.

An end member 24a provided on the web 24 of the U is adapted to be connected by linkage (not shown) to a locking lever of the bistable type (not shown) which may be shifted directly by means of a key or a door pull member. Each position of this lever corresponds to an extreme position of the carriage 8. In one of these positions shown in Figs. 1 and 2, the pins 27 are located at the end of their grooves 28 which is adjacent to the cover 4. The pins 29 are disposed against the inner face of the cam 20 and the cam 26 is near to the reducer 13. In the other extreme position, this cam 26 is near to the end wall 4a and the pins 29 are disposed against the reducer 13.

The switch 9 is fixed to the inner face of the end wall 4a and it has two fixed contacts 30, 31 and a moving contact 32 which bears elastically against the branch 25 of the carriage provided with the cam 26. The latter reverses the position of the contact 32 for each half-travel of the carriage.

The switch 10 fixed in the body 3 in the vicinity of the cover 4 is of the same type as the switch 9 and is reversed when its moving contact 33 which bears elastically against the cam 20 cooperates with a slope 23 of the latter and passes from the fixed contact 34 to the fixed contact 35 or vice-versa.

Fig. 5 shows diagrammatically the application of the invention to the simultaneous locking or unlocking of four doors, the luggage compartment and the trap door of the petrol tank of an automobile. The two actuators 1 of the front doors are such as described before, these two doors being equipped with manual locking levers which may be actuated directly or by means of a key. The other four actuators 1a are devoid of the switch 9 but are otherwise identical to the actuators 1.

A terminal of each motor 11 is connected permanently to the negative terminal of the battery 36 of the vehicle and the other terminal is connected to the moving contact 33 of the switch 10. All the contacts 34 are permanently interconnected in the same way as all the contacts 35. In each actuator 1, the contact 34 is connected to the contact 30 and the contact 35 is connected to the contact 31 whereas the moving contact 32 is connected to the positive terminal of the battery. Thus the motor 11 of an actuator 1 is supplied with electric current when and only when the moving contacts 32 and 33 simultaneously cooperate with two coupled fixed contact 34—30 or 35—31.

In the starting position, the six contacts 33 are on their contacts 34, and the two contacts 32 are on their contacts 31 which corresponds to the position shown in Fig. 1. The pins 29 of the carriage 8 are in two gaps 19 of the ramp carrying element 16 as seen in Fig. 2. All the locks of the vehicle are for example locked.

When the user shifts a lever by means of the locking pull member of a front door or by means of a key, he shifts the carriage 8 until its other extreme position shown in Fig. 3 is reached without resistance on the part of the driving unit 5 since the ramps 18 are located compietely outside the part of the pins 29.

Mid-way of the travel of the carriage, the cam 26 causes the contact 32 to contact the contact 30. This closes the circuit of the corresponding motor 11 but also those of the five other motors 11. All the motors therefore start to rotate and drive the respective elements 7 in the direction f. When these elements 7 have rotated through a quarter of a rotation, the slopes 23 of the cams 20 cause the six moving contacts 33 to engage the associated fixed contacts 35 which opens the electric circuits of the six motors and stops the rotation of the six elements 7. A situation which is exactly symmetrical to that shown in Fig. 5 is thus reached.

In the course of this rotation, the helical ramps 18 of the first actuator have encountered no obstacle since the corresponding pins 29 had already been brought manually to their opposed stable positions of Fig. 3. On the other hand, in respect of the other five actuators, the two ramps 18 had at their base a stud 29; the rotation of these ramps have therefore urged by the camming effect these two pins in the direction of the arrow g to their opposed stable position in the manner shown in Fig. 4.

Consequently, when the motors stop, all the pins 29 are each disposed against the corresponding reducer 13 in a gap 19 in facing relation to the base of the following ramp 18 (with respect to the direction f of rotation), and all the locks are unlocked. It is then possible to shift one of the two manual locking levers so as to initiate a new similar operating cycle which brings all the pins 29 and all the moving contacts back to their initial positions so as to once again lock all the locks. Here again, the situation of the pins of the actuators 1 in the gaps 19 has for result that the locking lever is shifted without obstacle without manually producing a rotation of the driving unit 5 and therefore with minimum effort.

Fig. 5 shows in dot-dash lines an optional dashboard switch 37 whereby it is possible to lock the six locks from inside the vehicle without having to actuate a manual lever. The moving contact 38 of this switch, which is connected to the positive terminal of the battery, may assume a locking position in which it cooperates with a fixed contact 39 connected to all the contacts 35, or an unlocking position in which it cooperates with a fixed contact 40 connected to all the contacts 34. It is clear that the actuation of this switch initiates

in each case an operational cycle such as that described hereinbefore.

By way of a modification, the lock of the luggage compartment and/or those of the rear doors may of course be provided with a control actuator 1 instead of a depending switch 1a and/or an additional actuator 1 or 1a may be provided on the lock of the engine bonnet. The invention is more particularly suitable for the locking or unlocking of any type of lock.

The actuator of the invention is very cheap and is well sealed. The shape of the ramps 18 may be easily adapted to the desired travel of the carriage 8.

CLAIMS

1. An actuator of a lever having two stable positions, in particular a lever for locking an automobile lock, said actuator comprising: a carriage movable between two extreme positions and adapted to be connected to the lever in such manner that said two positions correspond to the stable positions of the lever; a ramp carrying element which is movable and has two ramps acting in opposite directions on a projection of the carriage so as to shift the carriage from one extreme position to the other; an electric motor for driving the ramp carrying element; and means for interrupting the supply of current to the motor when the ramp carrying element reaches a position in which neither of the two ramps is in the path of the projection of the carriage.

2. An actuator as claimed in claim 1, wherein the ramp carrying element is cylindrical, the two ramps succeeding each other at a certain interval in the circumferential direction and the motor being a motor having a single direction of rotation.

3. An actuator as claimed in claim 1 or 2, wherein the motor is provided with a speed reducer.

4. An actuator as claimed in any one of the claims 1 to 3, wherein the interrupting means comprise a cam having a sloping part in alignment with the end of each ramp for reversing a switch having two positions.

5. An actuator as claimed in any one of the claims 1 to 4, comprising a control switch having two positions controlling the supply of current to the motor in combination with said interrupting means and actuated by the displacement of the carriage.

6. An actuator as claimed in claim 5, wherein the carriage has a cam, which mid-way of its travel, causes the reversal of the control switch.

7. A device for simultaneously actuating a plurality of levers, at least one of which levers may be actuated manually, said device comprising an actuator according to any one of the claims 1 to 6 connected to each lever, the actuator connected to the lever which is manually actuated being in accordance with one of the claims 5 and 6 and the connections being such that the supply of electric current to the motor of this actuator causes the simultaneous supply of current to the motors of the other actuators.

8. A device as claimed in claim 7, comprising a switch for simultaneously supplying current to all the motors and having two positions corresponding to the displacement in each direction of the levers.

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